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Strong ties, weak actors? Social networks and food security among farm workers in South Africa

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Title

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Abstract

Farm workers employed on commercial farms are among the poorest and most food insecure population groups in South Africa. This study investigated formal (organisational) and informal exchange relations and the association with food security within ego (N=561) and whole networks (N=54) among farm workers and their households on three commercial farms. All households were food insecure, with mildly food insecure actors (n=22) showing significantly smaller-sized networks with regard to total number of ties and food exchange ties compared to moderately food insecure actors (n=32). Informal exchange networks were largely kin-related and characterised by low economic status, located within a 50 km radius. While these networks represented an important strategy to cope with food insecurity, farm workers lack bridging ties to actors (individuals or institutions) outside the farm who may enable access to information and opportunities to mobilise resources towards enhancing food security and livelihoods in the long term. Shop owners and farm owners occupy a central position in the networks, highlighting dependency and ongoing paternalistic structures. This study contributes empirical data to the scarce literature on network analysis in the context of food security in South Africa, providing in-depth insights on a population that is formally employed, but remains poor, marginalised and forgotten in contemporary debates on food and nutrition security. Efforts to implement existing policies remain crucial to enable farm workers to access resource-rich networks, including socially more advantaged actors or organisations, in order to achieve better livelihoods outcomes.

Keywords

food security, social networks, farm workers, coping strategies, rural poor, South Africa

Introduction

Social networks refer to social actors, individuals or groups, and their social relations with each other (Scott and Carrington 2011). These relations can be *formal*, such as membership in organisations or associations, or *informal*, such as relations to kin, friends, neighbours, or colleagues, the latter being of particular interest with regard to resource transfers that enable social support (Baum and Ziersch 2003). Social networks are a form of social capital which is defined as both a community-level resource that can facilitate coordinated action (Putnam et al. 1994) and an individual-level resource where social capital can be transferred to other forms

of capital, such as financial, human, physical and natural capital (Bourdieu 1986; Department for International Development 1999). These capitals represent the assets base available to people who apply a range of diverse livelihood strategies to achieve certain livelihood outcomes, with food security being one such outcome.

While social networks constitute the structural element of social capital, subjective norms and perceived trust and cohesion are known as the cognitive element of social capital (Baum and Ziersch 2003). Studies across different geographical and social contexts indicate positive associations between cognitive social capital and food security, particularly with regard to perceived social cohesion and group participation. For example, in migrant Puerto Rican communities in Connecticut, low social capital in terms of low attendance of social events and church services was associated with higher levels of food insecurity (Dhokarh et al. 2011). In Canada, food insecurity among children (4–6 years) was associated with social deprivation and low social cohesion as perceived by mothers (Carter et al. 2012). In Zimbabwe, households headed by elderly people were more likely to be food secure when these persons were members of groups or associations that enable access to social support networks (Nyikahadzoi et al. 2013). Increased food insecurity among women living in a rural island community in Kenya was associated with less instrumental social support, measured as concrete direct ways in which people help each other (Nagata et al. 2015). There are, however, only a limited number of studies that focus on the association between structural social capital and food security in terms of the social structures within networks or associations. In Malawi and Burkina Faso, research revealed that the number of persons within resource-sharing informal networks can play a positive role in achieving food security in the context of adapting agricultural innovations (Mutenje et al. 2016) or access to quality diets (Becquey et al. 2012) respectively. Garasky et al. (2006) show that rural North-American households were less likely to be food insecure when they have larger informal support networks. More recently, network-analytical approaches that go beyond measuring the number of network actors in the context of food security have emerged (Lee et al. 2018; Collings et al. 2016; Mertens et al. 2015; Koster and Leckie 2014). However, few studies have been carried out within the African context.

Social network analysis is about social structures which describe actors and their relationships (Scott and Carrington 2011). A prominent social network theory refers to *strong* and *weak* ties between the actors within a network (Granovetter 1973). *Strong* ties are characterised by relationships between individuals or groups with similar demographic and socio-economic characteristics, often resulting in tightly-knit networks, also known as *bonding* social capital, enabling trust and cooperation. *Weak* ties are characterised by hierarchical or unequal relations due to differences in power and status, also referred to as *bridging* social capital, connecting groups of different backgrounds and locations. These bridges are of particular

importance in a development context as they enable more disadvantaged groups to connect with socially more advantaged groups to gain access to resources (Narayan-Parker 1999; Granovetter 1973; Islam et al. 2006).

Farm worker households belong to the most marginalised population groups in South Africa. These households are characterised by persisting poverty, high levels of food insecurity, low education levels, lack of access to infrastructure and governmental services, and social discrimination (Atkinson 2007; Du Toit 2004; Kruger et al. 2006; Wegerif et al. 2005; White 2010). The present-day destitute situation of farm workers is a result of colonisation, segregation, apartheid, capitalist development and post-apartheid development thinking (Atkinson 2007). This happened through virtual enslavement of, first, the indigenous Khoisan inhabitants into the colonial economy, and, later, the majority of the black and coloured population into the mining industry and farming enterprises, denying them dignity and self-determination (Terreblanche 2002). Racially discriminatory laws preceding apartheid, such as the Natives Land Act of 1913, restricted the black peasantry's access to land by preventing acquisition of property outside designated areas, the so-called 'homelands', which comprised 13% of the country's land mainly in rural areas. This gradually forced previous black farmers, who had often engaged in verbal sharecropping agreements with white landowners during the second half of the 19th century, into wage labour on white-owned farms (Van Onselen 1996), and resulted in farm workers and their families lacking rights and legal redress (Atkinson 2007). The loss of access to land destroyed agriculture and the land-based livelihoods of the majority of South Africans. In the 1960s, a shift was observed from labour-intensive to capital-intensive agriculture that led to a decline in farm employment (Wegerif et al. 2005). This was accompanied by other factors, such as changes in farm ownership and concentration of ownership among fewer farmers, drought and farm insolvency (Atkinson 2007). With the opening up of South Africa to the global market in 1994, increased competition, economic pressure and the removal of state subsidies in the agricultural sector resulted in many farmers being forced out of business or having to restructure their workforce. Almost 1.7 million farm workers were evicted from farms between 1984 and 2004 (Wegerif et al. 2005). Nowadays a majority of farm workers continue to be highly dependent on farm owners for access to food and other goods, services and accommodation (Kruger et al. 2006). Furthermore, farm workers are largely isolated from sources of information and social support beyond the vicinity of the farm and they face significant barriers with regard to accessing labour and other rights (Lemke and Jansen van Rensburg 2014). This is despite laws and policies having been put in place since 1994 for fair labour practices and security of tenure for farm workers (Department of

Land Affairs 1997). The government has largely failed to implement, monitor and enforce these laws (Cordes et al. 2011; Devereux and Solomon 2011, Visser and Ferrer 2015).

The network analysis applied in our paper allows an in-depth view into the nature of social networks among South African farm workers. We investigate these networks in the context of food and nutrition security, defined as a state "when all people at all times have physical, social and economic access to food, which is safe and consumed in sufficient quantity and quality to meet their dietary needs and food preferences, and is supported by an environment of adequate sanitation, health services and care, allowing for a healthy and active life" (Committee on World Food Security 2012:8). First, we illustrate the nature of individual formal (organisational) networks and informal exchange networks among farm workers and characterise different types of resource flows in these networks. We further apply basic network analysis to identify the differences in the network structures among actors and how this relates to the food security status of farm workers. Findings are then discussed within the broader context of livelihoods, food and nutrition security, providing a new perspective on farm workers who, despite being formally employed, remain poor and marginalised and are still largely neglected in contemporary debates on food and nutrition security.

Methodology

Research setting and sample size

Research was carried out in 2007 on three commercial farms in the North West province, South Africa, as part of a larger study that investigated nutrition security and livelihoods among farm worker households (Lemke 2005, Lemke et al. 2009). The farms are located within a radius of 15 km of each other, at a distance of 30 to 40 km to the nearest towns. Due to a lack of public transport, farm workers had to use expensive and irregular transport (private minibus taxis), making it difficult for them to reach these towns. All three farms were owned or managed by white farmers and practiced mixed crop and cattle farming, varying in size (160 to 2 900 hectares) and work force (between 7 to 32 full-time employed black male workers). A total of 39 households resided on these three farms at the time of data collection. The aim was to at least interview one person from each household or both partners from each conjugal household to enable both ego and whole network analysis. In four households, however, farm workers or their family were not available for interviews when the research team visited, either being at work, being away or busy with household chores. Therefore, the total sample of this study included 35 households, comprising of 54 farm workers or their family members. Of these households, 22 households were conjugal households and 13 were single headed. Both

partners were interviewed in 17 conjugal households and one partner was interviewed in each of the five remaining conjugal households. Household heads were interviewed in the 13 single-headed households and in two of these households two additional interviewees were selected because they formed part of these households as a family member. All interviewees were either formally employed by the farm owner or resided on the farm as family member or pensioner with the opportunity to engage in seasonal employment throughout the year. Therefore, we refer to our participant collectively as farm workers. After obtaining informed consent, face-to-face interviews were conducted in the local language, Setswana, with the help of local interpreters. Interviews took place either in the interviewees' homes or at a quiet place during working hours. Ethical clearance was obtained from the Institutional Research Ethics Regulatory Committee (00M21).

Research approach and data collection

A social network approach was applied, using a hybrid design: Ego network data were first collected and then whole network data were used based on relations between interviewed farm workers (Borgatti et al. 2013). Ego network data comprised of interviewed farm workers (ego) (n=54) and the persons (alters) to whom they were directly linked through informal exchange networks. These networks consisted of sharing, exchange or resource transfers between family, friends, work, or neighbourhood relations, including visits to each other and exchanges of material, financial and emotional support that occurred in reciprocal or non-reciprocal ways and in different amounts or frequencies. In this article, the terms sharing, exchange and resource transfers are used interchangeably, as recent research suggests that there are no clear boundaries between sharing (situational transfers based on demand and unconditional giving) and exchange (reciprocity in terms of strategic networking) (Schnegg 2015). Standard techniques, such as *name generators* and *name interpreters*, were incorporated into the questionnaire. *Name generators* enumerated alters (persons linked to ego), who either live on the same farm or off the farm, by asking the ego with whom they *actually* or *potentially* share or exchange resources. *Actual relations* were explored through questions based on factual resource transfers. The first question was: With whom of your family, friends or neighbours do you exchange visits? This question represents the total number of actual relations and was succeeded by the following questions:

- With whom of these persons do you eat meals or exchange food?
- With whom of these persons do you exchange money?
- With whom of these persons do you exchange small goods (e.g. paraffin, matches and soap)?

Potential relations were explored with the use of hypothetical questions based on support structures in times of need, including:

- Who would you ask in case you need any material support, including small goods and foods?
- Who would you ask in case you need any other assistance, such as writing a letter, care in times of illness, taking care of children or household chores?
- Who would you ask in case you need financial support, including small and large amounts of money?
- Who would you ask in case you need emotional support, including discussing important matters, needing advice?

Name interpreters collected details (attributes) of alters enumerated through name generators, such as gender, place of residence and spatial distance, and relationship to ego. In addition, each actor's economic status was determined by estimating monthly income ranges in their respective occupation, representing the income that the majority of South African employees would earn, differentiated according to the following three categories: low economic status (< ZAR 3 000 / USD 378 per month), medium economic status (ZAR 3 000 – 10 000 / USD 378 – 1 261 per month), and high economic status (> ZAR 10 000 / USD 1 261 per month) (currencies are converted based on the monthly average exchange rate in June 2008 on www.x-rates.com.).

The ego network data did not entail alter-to-alter relations. However, as the study sample included almost all farm workers residing on the three farms and their relations, this enabled a whole network analysis by extracting the relations between all farm workers that participated in the study. Alter-to-alter relations were extracted with the respective direction of exchange (e.g. actor A gives to actor B). Because the farm owners and shop owners in the area were mentioned by the majority of actors (n=45), farm owners and shop owners remained in the whole network data, although only in a one-directional relation (e.g. actor A asks farm owner for support, but farm owner is not asked whether s/he supports actor A). This is justified as a previous study on the same farms revealed that farm owners provide regular material and financial support to their workers (Lemke and Jansen van Rensburg 2014). Separate additional questions were asked on organised networks that are developed through formal and also informal organisation (e.g. church or informal savings group).

The food security status of each farm worker was assessed by means of household food security indicators. This assessment drew on a previous study that investigated the underlying causes of household food insecurity in rural and urban areas of South Africa (Lemke et al. 2003) based on indicators that were developed by Maxwell and Frankenberger (1992) and adapted to the specific South African context. For this study, we also drew on indicators and

categorisation developed by Coates et al. (2007). The following selected indicators were investigated:

- household characteristics (e.g. household size and composition);
- access to food (e.g. household income);
- availability of food (e.g. stores in proximity, home garden activities, small animal rearing);
- household food diversity (e.g. variety of food in the household during interviews);
- times of food shortage and hunger;
- worries about not having enough food;
- food preferences;
- access to clean water, sanitation and health services.

Data analysis

Following the hybrid design, network data were first analysed using an *ego network approach* and second a *whole network approach*. The *ego network analysis* applied descriptive statistics to describe basic ego network characteristics using SPSS (IBM Corp., version 25) with emphasis on the characteristics of alters (gender, relationship to ego, place of residence, economic status, kin relation) and dimensions of ego relationships referring to actual exchange (visits, exchange of food and meals, small goods, and money) and potential exchange (material, other assistance, financial and emotional support) to alters within and outside of the farm premises. To compare mean scores of alters between mildly and moderately food insecure egos, both the parametric *t*-Test and non-parametric Mann-Whitney *U*-Test were employed due to the small sample size (n=22 and n=32, respectively).

The *whole network analysis* was applied to illustrate the formation of informal exchange relationships between participating farm workers (actors) who lived on the three farms, presenting a subgraph of the ego network. Relational data between actors were transformed into an Edgearrey1 data list, including actor-to-actor relations (such as kin relations, actual and potential exchange relations). Relations between actors of the same household were not included. Attribute data were listed in a matrix format. Both files were uploaded into UCINET (Borgatti et al. 2002) for network analytical calculations, including cohesion measures of the whole network and extracted networks of mildly and moderately insecure actors. Cohesion

measures of the network graphs conducted in this study included (Borgatti et al. 2013; Scott 2013):

- Average degree: average number of relations of actors in the network
- Degree centralisation: the extent to which a network is dominated by the relations of one single actor
- Out-degree centralisation: Similar to degree centralisation, considering only relations that are directed away from the actors
- In-degree centralisation: Similar to degree centralisation, considering only relations that are directed towards the actors
- Density: the sum of relations in the network divided by the number of possible relations
- Component ratio: the proportion of components (set of graphs) to the number of actors. Its maximum 1.0 is achieved when all actors are isolated and the minimum of 0.0 when there is only one component
- Average distance: average number of relations that connect one actor with another actor in the network
- Dyad reciprocity: proportion of reciprocated relations to total number of relations

A UCINET *t*-test was applied to compare the means of cohesion measures of all exchange ties between mildly and moderately food insecure actors, with a significance value of $p<0.05$. The homophily among actors' attributes, such as place of residence, gender, household income and food security status, was described by calculating the Yules Q values by UCINET – a standard measure of association assessing the agreement of (non-)ties between (non-)similar actors, controlling for relative sizes of different categories (Borgatti et al. 2013).

For visualisation purposes, network data were further transferred into graphs with UCINET's network visualisation software called NetDraw (Borgatti 2002). NetDraw's optimisation algorithm for graph visualisation includes three criteria: correspondence between point distance and path distance between nodes (actors); nodes cannot be too close to each other to avoid overlays; and preference equal-length lines (relations). Three graphs were created with NetDraw that visualise: (1) all (actual and potential) relations between all actors, (2) all relations of mildly food insecure actors, and (3) all relations of moderately food insecure actors. Node symbols (representing actors) in each graph indicate farm workers and their respective food security status. Farm owners or shop owners are indicated by a separate symbol. The

size of node symbols indicates the in-degree measure of each actor. The direction of exchange relation (tie) between nodes is represented by directed arrows.

Results

Socio-demographic characteristics and household food security status

The socio-demographic characteristics of the study sample are displayed in Table 1. The majority of interviewees were born on a commercial farm (69.8%) within a radius of 50 km (66.0%). Income was mainly derived from full-time farm employment (53.7%) allocated to mainly male participants (data not shown). A quarter of all participants depended on governmental social grants (25.9%). On average, participants were 41.3 years old, had 3.8 years of schooling, and had been living in this farm area for a period of 11.7 years.

Table 1: Socio-demographic profile of participants

Socio-demographic indicators (N_{ego}=54)	**n**	**%**
Sex		
Male	28	51.9
Female	26	48.1
Place of birth[a]		
Farm	37	69.8
Urban area	12	22.6
Rural area	4	7.5
Distance to place of birth[a]		
1-50 km	35	66.0
51-100 km	6	11.3
>100 km	12	22.7
Income sources[b]		
Full-time farm employment	29	53.7
Social grants	14	25.9
Remittances	7	13.0
Seasonal farm employment	6	11.1
Informal trade	5	9.3
Off-farm employment	2	2.8
	M ± SD	
Age (in years)	41.3 ± 13.8	
Education level (in years)	3.8 ± 3.8	
Length of stay on farm (in years)[a]	11.7 ± 8.6	

Notes: [a] One person did not respond to the respective questions, n=53. [b] Multiple responses.

Initially, four categories were established to categorise household food security status, namely secure, mildly insecure, moderately insecure and severely insecure (based on widely used categorisation by Coates et al. 2007). Households categorised as *food secure* do not experience problems with obtaining food and do not worry about food. Households categorised as *mildly food insecure* have enough food in terms of quantity, but may worry about not always having enough food diversity. Households categorised as *moderately food insecure* frequently

worry about not having enough food in terms of quantity and diversity, and are at risk of going hungry or experiencing food shortage and hunger at certain times. Households categorised as *severely food insecure* experience regular food shortages and hunger. In this sample, 42.9% of participants (n=22) were living in mildly insecure households and 57.1% were living in moderately insecure households (n=32). None of the households were food secure or severely food insecure. Farm owners offered monthly food rations as payment-in-kind, mostly consisting of maize meal and sometimes milk, seasonal fruits and vegetables, as is common practice on other commercial farms in South Africa (Atkinson 2007). This prevented most farm worker households from entirely running out of food. We reported elsewhere in more detail on household food security among this study population, including an analysis of intra-household relations and gender roles. This analysis showed that female-headed households, although having less access to earned income, achieved greater food security, through better access to social grants, remittances from relatives and informal incomes, highlighting the importance of women's access to resources and decision-making within households (Lemke et al. 2009).

Formal and informal organisation

Table 2 summarises the affiliations of farm workers (N=54) with organised groups. The average number of affiliations per participants was 1.2, with the majority being affiliated to a church (92.6%). Most participants stated that they could rely on informal support from church members. Other group affiliations among participants were scarce, comprising of membership in informal savings groups (9.3%) and an interest group established by beneficiaries of a land restitution claim on one of the three farms (11.1%). On this farm, which was sold in 2006, the previous farm owner stayed as a shareholder and continued to manage the farm in cooperation with a total of 749 beneficiaries from various geographic regions of South Africa. Both the representatives of the beneficiaries and also farm workers urged the previous farm owner to stay as manager, as they feared that otherwise the farm would not be successful in future. Especially farm workers expressed concerns about their tenure security under the new ownership. All farm workers continued working on this farm after restitution, but tensions increased in 2010 with the gradual retreat of the previous farm owner (Lemke and Jansen van Rensburg, 2014). Three participants (5.6%) were part of a women's sewing group that had been initiated as part of a capacity-building programme carried out by North-West University. One participant was a communal councillor who attended municipal committee meetings.

Table 2: Group affiliations and informal support within organised groups

Group affiliation (N_{ego}=54)	**% (n)**	**Informal support[a]**

Church	92.6 (50)	yes (74%)
Informal savings groups	9.3 (5)	yes (20%)
Restitution beneficiary group	11.1 (6)	no
Women's sewing group	5.6 (3)	no
Municipality committee	1.9 (1)	no
Number of group affiliations per person *(M ± SD)*	1.2 ± 0.6	

Note: [a] Informal support in terms of sharing or exchange of foods, small goods or money, and information between members.

Informal ego networks

The characteristics of alters (as percentage of total number of alters) and size of informal ego networks (as mean number of alters per ego) related to farm workers' food security status are displayed in Table 3. The ego network of the total study sample (N=54) counts 561 alters (persons connected to ego), with 49.9% being male and 49.0% being female (six cases did not report on gender). Informal networks are narrow, with the majority of alters living within a radius of less than 50 km (92.8%). More networks are concentrated on the same farm (46.5%), compared to fewer networks with urban areas (24.5%). Networks are highly homogeneous with regard to alters' economic status, with the majority of alters having a low economic status (82.9%) as they are either unemployed or engage in low-income jobs, such as farm labour, domestic labour or seasonal employment. Almost two thirds of alters are kin-related to egos (60.5%). Three quarters of alters (74.9%) provide actual exchange roles (equivalent to exchange of visits), mainly sharing food (53.4%) or money (38.0%). The exchange of small goods, such as paraffin, matches or soap, is not common in this network (5.0%). Less than two thirds of alters provide potential exchange roles (61.0%), including other assistance (28.9%) and material (21.0%), financial (19.8%) and emotional (17.8%) support. This indicates that 'other assistance', such as helping with caring for children or the sick and with household chores, plays an important role in this setting.

Table 3 further shows that ego networks on average consist of ten alters. Potential networks are smaller than actual networks, consisting on average of six and eight alters per ego. Compared to mildly food insecure farm workers, moderately food insecure farmworkers tend to have significantly more relations to alters in general (mean 9.1 and 11.1, respectively), to alters living in the same house (mean 0.8 and 1.5, respectively), to alters living less than 50 km away (mean 8.3 and 10.5, respectively) and to alters with low economic status (7.3 and 9.1, respectively). Further, moderately food insecure farm workers tend to exchange food and meals with more alters (mean 6.4) than mildly food insecure farm workers (mean 4.4).

Table 3: Ego network characteristics of alters and network size per ego by household food-security status

	Missing[a]	% of all alters (n) (N_{alters}=561)	M ± SD Total alters per ego (N_{ego}= 54)	Alters per mildly insecure ego (n_{ego}= 22)	Alters per moderately insecure ego (n_{ego}= 32)	P-values[b] t-test	Mann-Whitney U-test
Alter characteristics							
Total number of alters	-	**100 (561)**	**10.3 ± 3.5**	**9.1 ± 2.7**	**11.1 ± 3.7**	0.043*	0.050
Gender	6						
Male		49.9 (280)	5.2 ± 2.5	4.8 ± 2.1	5.4 ± 2.8	0.381	0.528
Female		49.0 (275)	5.1 ± 2.6	4.3 ± 2.1	5.6 ± 2.8	0.072	0.078
Place	2						
same house		11.6 (65)	1.2 ± 1.0	**0.8 ± 0.6**	**1.5 ± 1.0**	0.002*	0.008*
same farm		**46.5 (260)**	4.8 ± 2.2	5.2 ± 2.3	6.6 ± 2.3	0.272	0.239
rural area		17.4 (97)	1.8 ± 2.2	1.7 ± 2.5	1.9 ± 2.0	0.756	0.454
urban area		24.5 (137)	2.5 ± 2.0	2.4 ± 1.9	2.7 ± 2.0	0.586	0.700
Distance	3						
<50 km		**92.8 (518)**	9.6 ± 3.4	**8.3 ± 2.8**	**10.5 ± 3.6**	0.022*	0.019*
51-100 km		1.4 (8)	0.2 ± 0.4	0.2 ± 0.5	0.1 ± 0.3	0.291	0.326
>100 km		5.7 (32)	0.6 ± 1.3	0.7 ± 1.7	0.5 ± 0.8	0.672	0.776
Economic status	16						
low		**82.9 (452)**	8.4 ± 3.2	**7.3 ± 2.4**	**9.1 ± 3.5**	0.045*	0.040*
middle		6.1 (33	0.6 ± 0.9	0.7 ± 1.0	0.5 ± 0.8	0.414	0.522
high		11.0 (60)	1.1 ± 0.6	1.0 ± 0.6	1.2 ± 0.7	0.533	0.589
Relationship roles	0						
Kin		**60.5 (299)**	6.8 ± 2.8	6.1 ± 2.0	7.3 ± 3.1	0.130	0.282
Non-kin		39.5 (195)	3.6 ± 1.9	3.2 ± 1.7	3.9 ± 2.0	0.182	0.140
Actual exchange roles[c]							
Visits (equals Total)	141	**74.9 (420)**	**7.8 ± 3.4**	7.1 ± 2.6	8.2 ± 3.8	0.268	0.400
Food (incl. meals)	145	53.4 (301)	5.6 ± 3.2	**4.4 ± 2.3**	**6.4 ± 3.5**	0.013*	0.038*
Small goods	145	5.0 (28)	0.5 ± 1.0	0.4 ± 0.8	0.6 ± 1.2	0.527	0.709
Money	143	38.0 (213)	3.9 ± 3.1	3.6 ± 2.8	4.2 ± 3.3	0.505	0.632
Potential exchange roles							
Total	-	**61.0 (342)**	**6.3 ± 2.5**	5.8 ± 2.0	6.7 ± 2.8	0.210	0.194
Material support	-	21.0 (118)	2.2 ± 1.5	1.9 ± 1.0	2.4 ± 1.7	0.251	0.522
Other assistance	-	28.9 (162)	3.0 ± 1.6	2.8 ± 1.6	3.1 ± 1.6	0.501	0.332
Financial support	-	19.8 (111)	2.1 ± 1.2	1.7 ± 0.9	2.3 ± 1.3	0.097	0.119
Emotional support	-	17.8 (100)	1.9 ± 1.0	2.0 ± 1.2	1.8 ± 0.9	0.388	0.559

Notes: * P-values <0.05, [a] Missing cases occur where participants could not report on alter characteristics or where exchange roles could not be captured accurately.
[b] P-values are from t-test and Man-Whitney U-test comparisons of mildly and moderately food insecure egos. [c] Actual exchange roles are based on visits and therefore excluded alters who live in the same house.

Table 4: Cohesion measures of whole networks

	All exchange networks*	kin	non-kin	Actual exchange networks (visits)	Actual food exchange	Actual non-food exchange	Actual money exchange	Potential exchange networks	Potential material support	Potential other assistance	Potential financial support	Potential emotional support
Networks of all actors												
Average degree	**3.09**	1.17	**1.93**	2.14	**1.54**	0.02	**1.17**	2.46	**1.37**	0.71	**1.31**	0.51
Degree centralisation	**0.07**	0.07	0.07	0.07	0.08	0.02	0.07	0.06	0.07	0.04	0.05	0.03
Out-degree centralisation	0.07	0.07	0.07	0.07	0.08	0.02	0.07	0.06	0.06	0.04	0.05	0.03
In-degree centralisation	0.38	0.09	**0.41**	0.09	0.06	0.02	0.07	0.40	0.10	0.06	**0.42**	0.03
Density	0.05	0.02	0.03	0.04	0.03	0.00	0.02	0.04	0.02	0.01	0.02	0.01
Component ratio	**0.45**	0.67	0.79	0.47	0.64	**1.00**	0.64	0.60	0.72	**0.90**	**0.90**	**0.91**
Average distance	**3.82**	1.71	1.64	3.91	**3.66**	**1.00**	**4.36**	3.22	2.25	**2.00**	**1.32**	**1.36**
Dyad reciprocity	**0.23**	**0.41**	0.14	0.36	**0.26**	0.00	**0.28**	0.16	0.19	0.14	0.09	0.11
Networks of mildly food insecure actors												
Average degree	**1.58**	0.69	0.91	1.13	0.71	0.00	0.60	1.29	0.64	0.42	0.64	0.29
Degree centralisation	0.11	0.10	0.10	0.12	0.08	0.00	0.11	0.09	0.06	0.04	0.06	0.04
Out-degree centralisation	0.10	0.10	0.10	0.11	0.08	0.00	0.10	0.09	0.06	0.04	0.06	0.04
In-degree centralisation	**0.13**	0.05	0.14	0.04	0.05	0.00	0.06	0.13	0.03	0.04	**0.15**	0.02
Density	0.04	0.02	0.02	0.03	0.02	-	0.01	0.03	0.02	0.01	0.02	0.01
Component ratio	0.89	0.93	0.96	0.89	0.96	1.00	0.93	0.96	1.00	0.98	0.98	1.00
Average distance	**1.54**	1.21	1.32	1.59	1.58	-	1.65	1.45	1.55	1.43	1.17	1.00
Dyad reciprocity	0.08	0.11	0.05	0.11	0.07	-	0.13	0.04	0.00	0.06	0.04	0.00
Networks of moderately food insecure actors												
Average degree	**2.11**	0.72	1.40	1.42	1.11	0.02	0.79	1.66	0.98	0.43	0.93	0.32
Degree centralisation	0.10	0.09	0.09	0.09	0.10	0.02	0.08	0.09	0.08	0.05	0.06	0.03
Out-degree centralisation	0.10	0.08	0.09	0.09	0.10	0.02	0.08	0.09	0.08	0.05	0.06	0.03
In-degree centralisation	**0.31**	0.06	0.33	0.07	0.06	0.02	0.04	0.32	0.08	0.05	**0.34**	0.03
Density	0.04	0.01	0.03	0.03	0.02	0.00	0.02	0.03	0.02	0.01	0.02	0.01
Component ratio	0.81	0.90	0.90	0.83	0.92	1.00	0.90	0.89	0.92	0.96	0.96	0.94
Average distance	**2.33**	1.27	1.37	2.32	1.72	1.00	2.47	2.08	1.44	1.39	1.16	1.30
Dyad reciprocity	0.10	0.15	0.07	0.14	0.07	0.00	0.08	0.06	0.06	0.05	0.04	0.06

Note: *Respective networks are visualised in Fig 1, 2 and 3.

Informal whole networks

The cohesion measures of whole networks of interviewed farm workers are shown in Table 4. The exchange networks (including actual and potential exchange) consist of an average of three relations per actor, including farm workers, shop owners and farmers (average degree = 3.1). Each actor in the network has on average more non-kin relations (average degree = 1.9) compared to kin relations (average degree = 1.2). Actual food and money exchanges as well as potential material and financial relations are the most common exchange roles in the network (average degrees = 1.5, 1.2, 1.4, 1.3, respectively). Degree centralisation is low (0.1), indicating that there are no single actors who dominate the overall network. However, the in-degree centralisation score shows a domination of actors, particularly with respect to potential financial support relations (0.4). The latter refers to the position of farm owners and shop owners to whom farm workers often turn to in times of financial need. The component ratio (0.5) shows that the whole network is relatively connected, with almost 50% of actors belonging to a component or group of actors. This indicates a relatively strong cohesion among actors with only a few isolated actors or isolated pairs of actors. The component ratio is high among the not so common exchange roles, such as actual non-food exchange and potential other assistance and emotional relations (1.0, 0.9, and 0.9, respectively), indicating more fragmentation within these relations. On average, the shortest distance between each actor in the network comprises of four ties (average distance = 3.8). Longer distances apply to actual food and financial exchange networks (3.7 and 4.7, respectively), representing more disperse relations, compared to shorter distances within actual non-food exchange networks (1.0) and potential other assistance, financial and emotional support networks (2.0, 1.3 and 1.4, respectively). In the latter, the short distance between actors is related to the higher component ratio reflecting a higher fragmentation among actors. Of all exchange relations, 23.0% are reciprocal. Reciprocity seems to be highest among kin relations (0.4) and actual food and money exchange relations (0.3).

Table 4 further shows the cohesion measures of extracted networks by food security status. Whole networks of mildly food insecure actors are characterised by a lower average degree (1.6), higher component ratio (0.9) and lower average distance (1.5) compared to moderately food insecure actors (2.1, 0.8, and 2.3, respectively). These measures suggest that networks of less food insecure farm workers are characterised by a smaller number of overall exchange relations and higher fragmentation among actors. On the contrary, networks of farm workers with higher food insecurity have a larger number of overall exchange relations with high connectedness among actors. Furthermore, the in-degree centralisation of financial support relations of moderately food insecure actors (0.3) is particularly high compared to networks of mildly insecure actors (0.1), indicating that the financial support from farm owners or shop owners is of particular importance for farm workers with higher food insecurity. Patterns of

actual and potential exchange relations, density and reciprocity between both networks are similar. While differences between cohesion measures of mildly and moderately food insecure actors seem evident, these were tested and found not significant.

The findings of the respective network cohesion measures referring to all actual and potential relations (Table 4) are visualised as network graphs: Figure 1 comprises all actors, Figure 2 comprises mildly food insecure actors, and Figure 3 comprises moderately food insecure actors. As is evident in all three network graphs, farm owners and shop owners (represented as circles) hold the dominant central positions in the network structure. The network graph of all actors (Fig 1) shows a closely knit network, with moderately food insecure actors (represented as filled diamonds) taking a more central position around farm or shop owners and mildly insecure actors (represented as empty diamonds), being mostly positioned on the outer skirts of the network. This pattern reflects the difference in in-degree centralisation among mildly and moderately food insecure actors (Table 4) where more insecure actors depend stronger on financial support from farm owners or shop owners.

Comparing the network graphs for mildly and moderately food insecure actors (Fig 2 and 3), it is obvious that the network graph illustrated in Figure 3 appears with more relations (higher average degree), more compactness (lower component ratio) and with more centralised power (higher degree centralisation), with farm owners and shop owners holding these dominant positions.

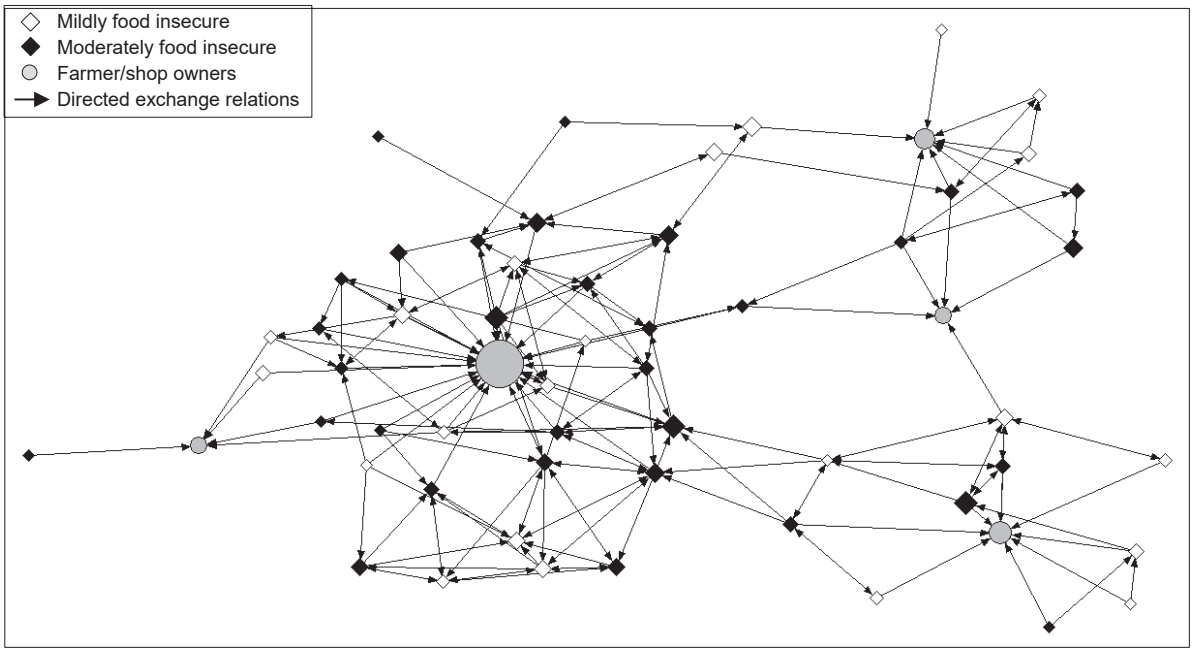

Fig 1 Exchange network of all actors

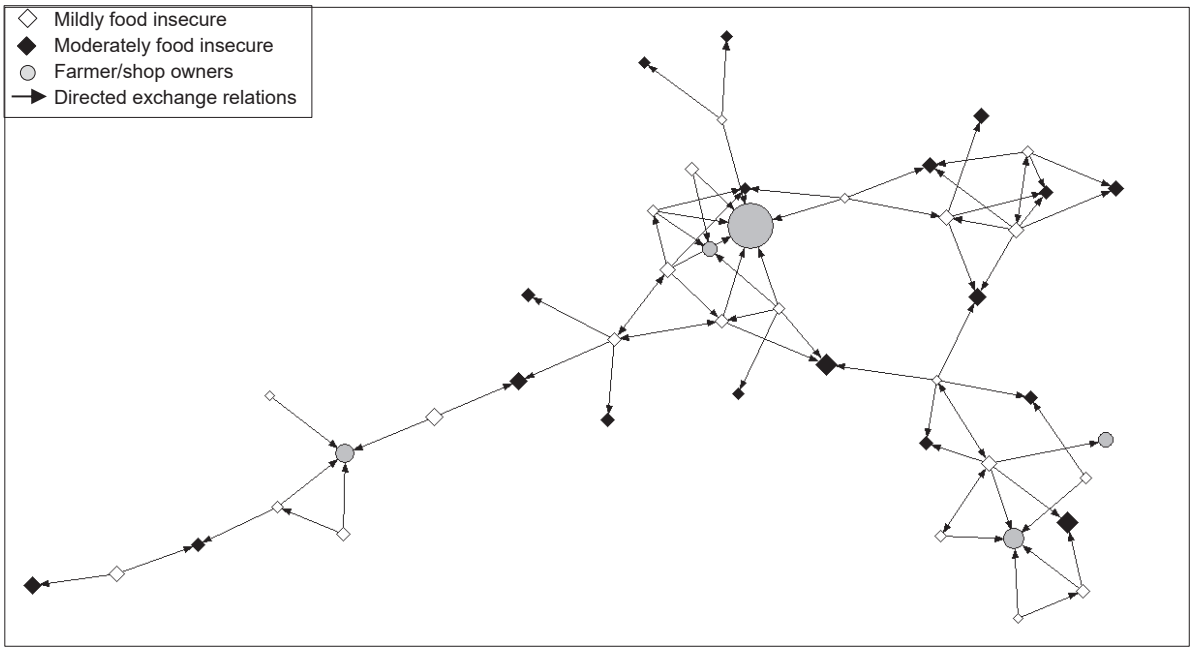

Fig 2 Exchange network of mildly insecure actors

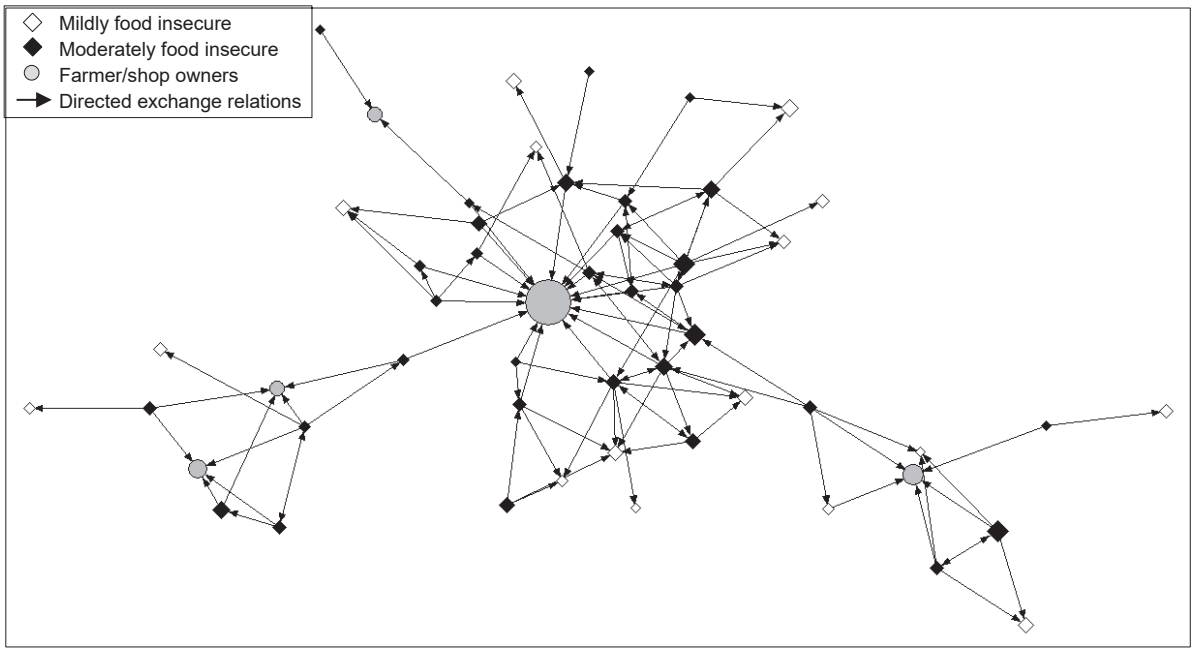

Fig 3 Exchange network of moderately insecure actors

With regard to homophily among actors within the whole informal network (see Table 5), a small to moderate association was found in all exchange networks among actors from the same place, reflecting the distance between farm settings as being an obstacle to exchange relations across farms. Further, gender and income homophily occurs more strongly within actual networks compared to potential networks, indicating that actors of the same gender or

with similar income tend to turn to actors with similar attributes for actual support. Exchange relations among actors neither show homophile nor heterophile associations in terms of their food security status.

Table 5: Yules Q values as measure for similarities among actors attributes

Actor attributes	All exchange networks	Actual exchange networks	Potential exchange networks
Place of residence	**0.234**	0.191	**0.252**
Gender	0.165	**0.419**	0.115
Household income	0.153	**0.200**	0.156
Household food security	0.019	-0.025	0.090

Discussion

Applying a network-analytical approach, our study added new insights into the social structures of three farm communities, highlighting differences of social exchange relations between farm workers with different food security statuses.

In our study, networks among farm workers were strongly connected and highly homogeneous, with the majority of actors living in the same farm setting characterised by low human (e.g., health status and education), financial (e.g., economic status) and physical (e.g., infrastructure) capitals. Within these networks, food, material and money exchange were most common. As such, these 'strong-tied' networks among equally disadvantaged actors were important to cope with ongoing food and livelihood insecurity, but only provided limited opportunities for farm workers to enhance their food security in the long term. Other studies in different geographical and social contexts also highlighted the reliance on informal networks as an important coping strategy among the poor (Beaumier and Ford 2010; Dawson 2013; Kaschula 2011; Mtika 2001; Nanama and Frongillo 2012). Adato et al. (2006) state that relations among poor households at best seem to stabilise livelihoods at low levels, but do not improve long term economic advances and upward mobility. Lohnert (2007:14) refers to the ambivalent function of social networks as a support or control mechanism in general development processes: "The majority of the marginalised population has no choice but to fall back on relational social networks, as institutional frameworks might not be of any help." This was confirmed by our study, with farm workers engaging only to a limited extent in formal (organisational) networks, such as churches or savings groups, located in the same or neighbouring communities. Bridging ties that could overcome spatial and social distances to connect to more powerful groups, for example political parties, civil society organisations, labour unions, or municipal services as part of institutional structures (e.g., health and social services) are largely absent. None of the research participants belonged to a labour union as no unions are represented in the area. This also reflects the weak organisational position of

farm workers in this study, as is the case for other regions of South Africa. There are some exceptions, for example farm workers on wine farms in the Western Cape (Lemke and Jansen van Rensburg 2014).

An exception to the homogeneity in the farm workers' networks were the relations to the farm owners and shop owners who lived in the same setting but had much higher financial, human and physical capital, representing a socially advantaged group. Our whole network analysis showed that farm owners and shop owners held dominant positions within the network structure, particularly with regard to potentially providing financial support. Relationships on commercial farms are characterised by paternalistic structures exerted by farm owners, with farm workers depending on employment and social support, which is deeply rooted in the historical context. Paternalistic structures largely continue to exist, despite protective legislation for farm workers aimed at shifting these power relations (Lemke and Jansen van Rensburg 2014). Within these structures, farm owners control the living environment and also social activities of farm workers. At the same time, farm owners are the most influential people to turn to for assistance, besides relatives, as is illustrated by our findings. The relationships can therefore not serve as a bridge for farm workers to overcome the social gap.

Our study found differences in network structures between farm workers with different food security statuses. The networks of more food insecure farm workers were not only characterised by a higher number of alters but also a stronger connectedness and power centralisation, with farm owners and shop owners holding these dominant positions. On the contrary, networks of less food insecure farm workers included a smaller number of relationships that showed more fragmentation and less dependency on farm owners and shop owners. Further, more food insecure farm workers exchanged food with significantly more alters, compared to less food insecure farm workers. These findings contradict with other studies in Africa, such as Ethiopia and Tanzania, in which poorer people often have smaller exchange networks (McGuire 2008, Cleaver 2005). This difference is most likely due to the specific situation of South African farm workers who despite having different food security statuses face the same economic, social and physical constraints. Nonetheless, our results suggest that less food insecure farm workers were able to more effectively negotiate their exchange relations within a specific set of actors, compared to the strong dependency on large and compact networks of more food insecure farm workers. This assumption is in line with Cleaver (2005) and McGuire (2008) who emphasise that social networks are not egalitarian and poor people often have less agency within their social networks to unlock opportunities for empowerment and prosperity in the long term.

Our findings are of relevance in the present-day context as the situation of farm workers has not improved over the past decade, but has rather deteriorated. This is due to various factors that put farm workers even more at risk in future: exposure to globalised markets, corporate

concentration and centralisation, especially in the agriculture and food sector; the trend of larger-sized farms and increased mechanisation and the resulting loss of employment; uncertainty with regard to the future of livelihoods in the agricultural sector; and recent developments with regard to land reform and the potential threat of expropriation (Visser and Ferrer 2015, Visser 2016, Cousins 2017, Greenberg 2017). The long term consequences of these developments are uncertain for all people involved in the agricultural sector, including white farm owners, who in most cases provide the only employment opportunity and social security for farm workers, and who face severe challenges in the current economic and political environment (Lemke and Jansen van Rensburg 2014).

We return to our initial question in the title of this paper, whether social networks among farm workers can be described by strong ties and weak actors. Despite their well-known marginalised and impoverished position, we conclude that farm workers should not be perceived as 'weak' actors, as they show a certain degree of agency within their social networks to cope with ongoing food and livelihood insecurities. However, the strongly-tied networks with equally impoverished farm dwellers and the highly unequal relations to farm owners and shop owners do not provide enough opportunities to enable socio-economic uplifting and full food security for farm worker households in the long term. Efforts towards implementing existing policies remain crucial to enable access to resource-rich networks or to more socially advantaged actors (individuals or institutions) with a view to achieving better social organisation and collective actions for improved livelihood outcomes, such as food and nutrition security, in marginalised communities.

Conflict of Interest

The authors declare that they have no conflict of interest.

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